PHYS 1341/2341: Thermodynamics and Statistical Mechanics, Spring 2022

Class: Tue/Thu 9:30-10:45am, 11 Thaw

Professor: Andrew Mugler (he/him), 206 Allen, andrew.mugler@pitt.edu

TA: Brenda Gomez Cortes (she/her), 109A-5 OEH, bdg43@pitt.edu

Books: Fermi, *Thermodynamics* | Kennett, *Essential Statistical Physics*
Optional: Reif, *Fundamentals of Statistical and Thermal Physics*

Office Hours: Andrew: By appointment—please do not hesitate to email.
Brenda: Tue 12-1pm, https://pitt.zoom.us/j/9133369627

Credit: 40% Homework quizzes* | 20% Midterm exam | 40% Final exam
*Last 15 min on Thu, random HW problem, possibly modified
*Makeup quiz must be excused in advance and taken within 1 week

Virtual | Pre-recorded | No class | Exam | Homework quiz | Ungraded HW quiz (virtual)

Jan 11	Introduction	Jan 13	Probability/statistics 1.2
Jan 18	Micro/macrostates 1.3, 1.4, 5.1.1	Jan 20	Microcanonical ensemble 2
Jan 25	Temperature, entropy 2.1, IV.13	Jan 27	Pressure
Feb 1	Heat capacity II	Feb 3	State transitions I, II
Feb 8	Heat engines III	Feb 10	Refrigerators III
Feb 15	Thermodynamic potentials V B.3	Feb 17	Canonical ensemble 4, 4.4
Feb 22	Kinetics 5	Feb 24	**Midterm exam**
Mar 1	Partition function 4.2	Mar 3	Gibbs' paradox 4.5
Mar 8	**Spring break**	Mar 10	**Spring break**
Mar 15	Equipartition theorem 4.7	Mar 17	Non-ideal gases 4.6 IV
Mar 22	Phase transitions	Mar 24	Critical points
Mar 29	Grand canonical ensemble 6	Mar 31	Chemical potential 6.1
Apr 5	Quantum gases 7	Apr 7	Quantum statistics 7.3
Apr 12	Blackbody radiation 9.1	Apr 14	Ising model 10
Apr 19	Ising model 10	Apr 21	Conclusion
Apr 25-29	**Final exam** (day/time TBD)		

Learning Objectives:
- Demonstrate understanding of the concepts, principles, and laws of thermodynamics and statistical mechanics.
- Describe a physical situation using multiple representations as necessary, such as written conceptual statements, mathematical equations, diagrams, and graphs, and be able to translate from one representation to another.
- Apply mathematical concepts and methods such as probability and statistics, algebra, calculus, and trigonometry as necessary to analyze and solve problems.
- Use physical reasoning and units to obtain order-of-magnitude estimates.

Academic Integrity is of paramount importance. Violations will not be tolerated.
Disability Resources and Services are available for accommodations.
Title IX mandatory reporters include professors. I am required to report violations.